PROSPECTUS

SCHOOL OF SCIENCE AND ART,

PROPOSED TO BE ESTABLISHED IN CONNECTION WITH THE

LIVERPOOL MECHANICS' INSTITUTION,

UNDER THE SANCTION AND WITH THE AID OF THE

COMMITTEE OF HER MAJESTY'S MOST HONOURABLE
PRIVY COUNCIL FOR TRADE.

JANUARY, 1854.

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PROSPECTUS.

THE Directors of the Liverpool Mechanics' Institution have observed, with much interest, the growing attention lately manifested by the public, on the important subject of Industrial Instruction, more especially since the occurrence of the Great Exhibition of 1851. They have also marked, with still greater satisfaction, the establishment of the Department of Practical Science and Art under the Board of Trade, the subsequent organization of a Metropolitan School to teach the principles of Science and Art involved in the Arts and Manufactures, and the resolution of Her Majesty's Government to stimulate, by pecuniary aid and other encouragements, the establishment of institutions having similar aims in all the great towns in this country.

The chief object of the Mechanics' Institution was declared, at the time of its establishment in 1825, to be "the instruction of Mechanics and Artizans in those branches of Science and Art which are of practical application in the exercise of their several Trades;" and the efforts of its Supporters have always been earnestly directed to secure for young men, to be afterwards employed as Mechanics, Architects, Engineers, or Merchants, an education as strictly preparatory to their various pursuits, and altogether as complete in its character, as that for which the Lawyer, the Physician, or the Clergyman have now recourse to the Inns of Court, the Medical Schools, and the Universities. This important object has

indeed been only partially accomplished, but how much has been effected to facilitate its complete realization will be most clearly shown, by a brief notice of the various departments which have been successively organised in connexion with the Mechanics' Institution.

The EVENING SCHOOL, opened in the summer of 1825, is now attended regularly by upwards of Five Hundred students, consisting chiefly of mechanics, and other young men engaged in business during the day. The School meets for two hours four times every week, and affords instruction in English Reading, Grammar, and Composition; Geography and History; Writing and Arithmetic; Drawing, Mathematics, Navigation; the Elements of Natural Philosophy and Chemistry; Ancient and Modern Languages, and Vocal Music. The Fees vary from 2s. 6d. to 10s. per quarter.

The LOWER DAY-SCHOOL, opened in 1835, for boys of all ages from six years upwards, affords a thoroughly practical English education, including Drawing, and a much more rigorous and comprehensive course of instruction in the Sciences than is usual in ordinary day-schools. This School is also attended by upwards of Five Hundred pupils, and the Fees paid vary from 15s. to 18s. 6d. per quarter.

The HIGH SCHOOL, another day-school, was opened in 1838, for the purpose of combining a Classical Education with a superior course of instruction in Science. The fees range from £1 13s. to £3 10s. per quarter.

The GIRLS' SCHOOL, opened at Blackburne House in 1844, offers an education, characterised by the same strict reference to the practical business of life, at fees varying from £1 5s. 6d. to £1 8s. per quarter.

In addition to these schools, a LIBRARY has been

formed numbering upwards of 16,000 volumes, and containing many standard works in every department of Science and Literature; a GALLERY of SCULPTURE, furnished with nearly Four Hundred Casts from the best specimens of Ancient and Modern Art; a MUSEUM, containing a great variety of objects of Natural History, Mineralogy, Geology, Historical Antiquity, &c.; and a collection of Philosophical Apparatus.

The BUILDING occupied by the Institution, which has been erected and furnished at an expense of nearly £30,000, contains a large and convenient Lecture Room, twenty-five spacious Class Rooms, a Library, Reading Room, Offices, &c.

Such is the present organization of the Establishment, which depends for its support solely on the Fees paid in the several departments, and in which about Fourteen Hundred pupils are enjoying the benefits of a superior and highly practical education.

While the Institution has thus undoubtedly attained an eminently important position as a general Educational Establishment, circumstances have hitherto rendered it impossible to adopt any suitable arrangements for such extended instruction in the practical applications of Science and Art as it was the earnest desire of its founders to secure for their fellow townsmen. Now, however, that the importance of such instruction is so much more generally acknowledged, and more especially since Her Majesty's Government have signified their intention to promote every effort which may be made in a spirit of self reliance, to bring such instruction within the reach of the great body of the people, it seems that the time has arrived when this object may at last be satisfactorily accomplished.

Accordingly, it is now proposed, under the sanction and with the aid of the Committee of Her Majesty's most Hon. Privy Council for Trade, to establish, in addition to the existing arrangements in the Institution, a school, offering a comprehensive course of instruction in Science and Art as applied to the Mechanical, Chemical, and Decorative Arts, and in certain other branches of knowledge calculated to form a useful addition to the ordinary education of young men about to enter on apprenticeships with Merchants or other General Traders.

It is fortunately as unnecessary, as it is obviously inexpedient under such circumstances, that the scheme for the new school be encumbered with any provision for giving instruction in the more elementary departments of knowledge. The degree of attainment which may be reached by the pupils completing the course of instruction in the Lower School, where the moderate rate of fees may be considered as falling quite within the means of the great body of the people, seems, under the circumstances, to be only a fit and reasonable standard of qualification to be required of students who may propose to enter the new establishment.

Pupils who have completed the course of study, prescribed for the Lower School, which may occupy a period of about six years, will generally be found, at the age of fourteen, to possess the following qualifications, viz. :—

In English — able to read fluently any non-technical author, and possessing a fair acquaintance with Grammar, Geography, and History.

In Writing—able to write well and rapidly without orthographical mistakes.

In Arithmetic — thoroughly acquainted with the elementary Rules, and Common and Decimal Fractions, with their applications to Commercial Arithmetic.

In Geometry—well acquainted with all the problems in the First Six Books of Euclid, and with Plane Trigonometry.

In Algebra—well acquainted with the introductory portions, Simple and Quadratic Equations, and Series by Differences and Quotients.

In Physics — acquainted with the Elements of Statics, Dynamics, Hydrostatics, Hydrodynamics, Pneumatics, Heat, Light, Electricity, and Magnetism.

In Chemistry—generally acquainted with the properties of Elementary Bodies, Compounds of the Metals with Non-Metallic Elements, the more important Mineral Acids and their Salts, the Organic Radicals, Acids and Bases, the Compounds of the Organic Radicals with Metals, and the principal Salts of the Organic Acids.

In Drawing — to draw readily and correctly the Elementary Series of Free-Hand Examples.

This standard may be, indeed, in some particulars, higher than pupils will generally be found to have attained in schools less numerously attended, and where the principle of the division of labour is less perfectly developed than in the Lower School; and were the new School to stand wholly unconnected with any establishment in which elementary instruction in Science and Art might be secured, the expediency of adopting so high a test, as an entrance qualification, might fairly be questioned. When it is kept in view, however, that any deficiency in the qualifications of intending pupils, may be readily made up in the Lower School, and at less expense (only 18s. 6d. per qr.), than would under other circumstances be found possible, and when it is farther

considered how very important it must prove to the real usefulness and educational status of the proposed School that no time be lost there in dealing with pupils imperfectly prepared to enter upon their studies, it seems to be in all respects desirable that the standard of attainment, previous to entrance, be fixed at the highest point which circumstances will admit.

This standard of qualification for admission being adopted, it is proposed to offer a Course of Instruction which may either be completed in one year, or extended over a longer period according to circumstances. It is further proposed that the School meet during ten months in the year, this period being divided into two sessions of five months each, one commencing in January, and the other early in August. As each subject of instruction will be commenced at the beginning of every session, pupils will have the option of entering at either term, and, supposing the whole course of study to be completed in one year, the order in which the subjects are to be taken is shown in the following programme; but different arrangements may be adopted for students who propose to attend for longer periods.

PROGRAMME.

FIRST SESSION.

I. MATHEMATICS.

TIME:—SIX LESSONS WEEKLY = 132 HOURS.

Algebra from Quadratic Equations: Combinations and Permutations, Binomial Theorem, Indeterminate Co-efficients,

Recurring Series, Exponental Series, Logarithmic Series, Theory of Equations, and Solution of Equations of the higher degrees.

Analytical Trigonometry.

Analytical Geometry, Geometrical Constructions, Problems on the Position of Straight Lines, &c., Conic Sections.

Descriptive Geometry.

Differential and Integral Calculus.

II. Physics.

Time:—Four Lessons Weekly = 88 Hours.

Physical Properties of Solid Bodies: Motions; Rectilineal and Curvilineal; Causes of Motion, as Gravitation, and Impact: Composition and Resolution of Forces, Centre of Gravity, Descent of Bodies, Inclined Plane, Screw, Wedge, Balance, Wheel and Axle, Pulley, Pendulum, Resistance, Friction.

Physical Properties of Liquids: Pressure, Specific Gravity, Equilibrium, Motion, Resistance, Flotation, Hydrostatic and Hydraulic Machines, Artesian Wells and Fountains.

Physical Properties of Gases: Pressure, Gravity, Equilibrium, Motion, Resistance, Diffusion, Pneumatic Machinery.

Light: Corpuscular and Undulating Theories, Sources, Intensity, Diffusion, Velocity, Aberration, Reflection, Photometers, Refraction, the Prism, Rainbow, Chromatic Phenomena, Polarization, Optical Instruments, Thermal and Chemical effects of Light.

Heat: Sensible and Latent Heat, Diffusion, Capacity for Heat in various bodies, Changes produced by Heat, Thermometry, Boiling Point of Liquids, Vapours and Gases, Hygrometry, Sources of Heat, Applications of Heat, Production of Steam, Heating and Ventilation, Comparison of the laws of Light and Heat.

Magnetism: Natural and Artificial Magnets, Terrestrial Magnetism, Magnetic effects of Light.

Electricity: General Phenomena, Frictional Electricity,

Galvanic Electricity, Currents, Electrical Apparatus, Electro-Magnetism, Magneto-Electricity, Diamagnetism, and their Applications.

Meteorology: The Atmosphere, Distribution of Heat in the Earth's Surface and Atmosphere, Variations of Temperature, Mean Temperature, Winds, Trade Winds and Monsoons, Storms, Water contained in the Atmosphere, Dew Point, Clouds, Rain, Snow, Hail, Rainbows and Halos, Aërolites, Atmospheric Electricity, Lightning and Thunder, Lightning Conductor, Barometer.

III. Chemistry.

Time:—five hours weekly = 110 Hours.

Inorganic Chemistry: The Laws of Chemical Affinity and Combination, Elementary Bodies and their Properties, Compounds of the Elementary Bodies with each other, Bodies produced by the Union of two or more Compounds.

Organic Chemistry: Organic Radicals, and the Compounds formed by their Union with Elementary Bodies.

Compounds, consisting of an Oxide of an Organic Radical and an Acid, both Natural and Artificial, Indifferent Compounds.

Mineral Analysis; Qualitative and Quantitative.

Organic Analysis; Qualitative and Quantitative.

IV. Natural History.

Time:—Five Hours Weekly = 110 Hours.

Mineralogy: Physical Properties of Minerals, Chrystalography, Species and Varieties of Minerals, Mechanical Preparation and Dressing of Ores, Conditions in which they are Discovered, Places and Modes of their occurrence, Commercial Value and Uses.

Botany: Structure, functions, and habits of Plants, Description of Genera and Species Existing and Extinct,

Distribution, &c., especially of such as are of Economical or Commercial Value, viz., Food-plants, Timber-trees, Dye-woods, Medicinal Plants.

Zoology : Structure, functions, and habits of the different Genera and Species of Animals Existing and Extinct, Distribution.

Geology : Geological Processes now in action on the surface, and in the interior of the Earth, as far as such have been observed, Origin of Stratified and Non-stratified Rocks, Marine Denudations, Formation of Deltas, Salt-water Lakes, Areas of Subsidence and Elevation, Coral Reefs, Volcanic Phenomena, Earthquakes.

Substances entering into the Composition of Rocks, Series of Geological Formations, Organic Remains, Distribution of Coal, Iron, and other important Minerals.

V. Political Economy, and Law.

Time :—Two Hours Weekly = 44 Hours.

Labour the source of production : Division of Labour, Machinery, Capital, Supply and Demand, Population, Individual Rights and Duties, Education.

Constitutional, Commercial, and International Law.

VI. Drawing.

Time :—Ten Hours Weekly = 220 Hours.

Geometrical and Perspective Drawing, Outlines of Ornament, and Elements of the Figure, from the Flat ; Ornament and Figure from Shaded examples and from the Round, Drawing from Solid Models, The Principles of Colour, Mechanical Drawing, Architectural Drawing, and Naval Architectural Drawing.

SECOND SESSION.

I. Applied Mathematics.

Time:—Seven Hours Weekly = 154 Hours.

Statics, Dynamics, Hydrostatics, Hydrodynamics, Optics, Astronomy, and Navigation.

II. Applied Mechanics.

Time:—Seven Hours weekly = 154 Hours.

Applications of the Principles of Mechanics: Strength and Strain of Materials, Beams, Columns, Axles, Braces, Struts, Roofs, Arches, Bridges, Pressure of Earth, Retaining Walls, Foundations, Piers, Abutments, Embankments.

Friction, Velocity and Apparatus for regulating Velocity, Dynamometers, Contrivances for Converting Rectilineal into Curvilineal Motion, and vice versa, Principles of Wheel Work, Steam Engine, and Boilers.

Flood-gates, Locks, Sluices, Water-wheels, Turbines, Forms of least resistance, Ship-building, Force of Wind, Windmills, Machinery for various purposes.

III. Applied Chemistry.

Time:—Seven Hours Weekly = 154 Hours.

Analysis of Articles of Commerce:—

Applications of Chemistry to the Useful Arts, Various kinds of Fuel, and the Comparative Value of each under different circumstances, Furnaces and Stoves, and the materials employed in their construction, Substances employed for the purpose of Illuminating, and their different Values, Smelting, or the Extraction of Metals from their Ores, Formation of Alloys, Electro-Plating, and Casting.

Manufacture of Earthenware, Porcelain, Glass, and the Process of Enamelling.

Manufacture of Compounds of Potash, Soda, Lime, Alumina, Tin, Iron, Manganese, Cobalt and Copper, used in the Arts.

Manufacture of Nitric, Sulphuric, Hydrochloric, Boracic, and Oxalic Acids.

Manufacture of Mortars and Cements.

Manufacture of Colours, Oils, Paints, Varnishes, and Bleaching Liquids.

Bleaching, Dying, Soap-making, Malting, and Brewing.

Manufacture of Wines and other Fermented Liquors.

Distilling, Baking, Preserving of Fruits and Provisions.

Manufacture of Starch and Arrowroot.

Tanning, Inkmaking.

Manufacture of Coal Gas, Tar, Rosin, Naphtha, Acetic Acid, and other products of the distillation of wood and coal.

Manufacture of Gunpowder, and Congreve Matches.

Chemical and Pharmaceutical Preparations.

Chemistry of Agriculture, Horticulture, and Dietetics.

IV. Physical Geography.

Time:—Two Hours Weekly = 44 Hours.

The Globe as a member of the solar system, Structure of the Crust of the Earth, Distribution of Land and of Water, Mountain Chains and Volcanoes, Contour and Relief of Continents, Table Lands, Plains, Ocean Beds.

Effects of the Distribution of Land and Water, Relief, and other conditions, on Climate; Lines of equal Summer and Winter Temperature, The Precipitation of Vapours, Rain, Rivers, Watersheds, Oceans and their Currents, Winds Constant and Variable, Storms.

Effects of Climate on Plants and Animals, and the Limits of their Distribution.

Geographical Distribution of the Human Race, Relations of the Various Tribes and Nations.

Commercial and Economical Statistics.

V. Drawing and its Applications.

Time: — Ten Hours Weekly = 220 Hours.

Ornament and Figure from the Antique, Modelling of Ornament, and of the Figure as applied to Ornament; Casting and Moulding.

Painting in Water-Colour, Tempora, Fresco, Oil, and Encaustic, from Ornament and from Nature; Landscape, Animals, Foliage, Flowers, Fruit, &c.

Compositions and Original Designs for Decorative Manufactures, as Paper Hangings, Woven Fabrics, Jewellery, Ornamental Castings, Pottery, and Furniture.

Mechanical Drawing: Drawing of Machinery from dimensions, Specifications of Materials and Work required for Construction.

Architectural Drawing: Designs and Original Plans for Buildings, Measurement of Plans and Specifications of Work and Materials.

Naval Architectural Drawing: Details of the Construction of Vessels, Specifications of Materials and Work from Measurement of Plans.

Mapping, from Surveys and Measurements.

The prime object of the School being to give an eminently practical direction to the study of Science and Art; the foregoing course will be illustrated, as far as possible, and at every stage of its progress, by immediate reference to actual specimens, and models, of the subjects under review, such as the various geological formations, fossil remains, ores, chemical products, metals in the different stages of manufacture, substances employed in building, and other raw materials, with the modes of converting them into industrial products; animals, plants, machinery, and tools.

The Instruction will be conveyed chiefly in the form of Lectures, recourse being very frequently had, however, to the catechetical method to test the general progress of the pupils, to remove difficulties from the minds of individuals, and to discover those of superior talents and attainments.

It is proposed that Students be entered either with the view of completing the entire course of Instruction, or for the purpose of attending such a class or such classes as are suitable to the particular objects they may have in view. The Students entering for the entire Course, however, are those only of whom any standard of qualification will be required on entrance, and they only will be entitled to compete for any honours or rewards which may be offered in the School.

It is anticipated that the Government Department of Science and Art, may grant annually, at least, One Exhibition tenable for two years, to the Metropolitan School of Science and Art in London, to be awarded to the best qualified Student; while, to other pupils, who may satisfactorily complete the whole of the prescribed Course of Study, it is proposed to grant Diplomas certifying the fact; and if the experience of analogous establishments in this, as well as in other countries, is to be trusted, these documents will prove of great service, in securing for their possessors highly remunerative employment wherever Scientific acquirement or Artistic skill has proved to be important in enhancing the value of industrial products.

The Fee proposed for students intending to complete the whole Course of Instruction in one year is £5 5s. for each session, or for the two sessions together £8 8s.

For students desiring to prolong the period of study beyond one year, the Fees will be modified to suit the circumstances.

The following are the terms proposed for pupils who may enter for instruction in any separate subject:

	£.	s.
Mathematics	2	0
Applied Mathematics	2	10
Physics	1	7
Applied Mechanics	2	10
Chemistry	1	15
„ applied to the Arts	2	10
Natural History	1	15
Physical Geography	1	0
Political Economy	1	0
Drawing, 1st Course	3	10
Drawing and its applications	3	10

In addition to the Classes already proposed, it seems essential to the completeness of such a School that opportunity be afforded to students of Chemistry for entering on longer or shorter periods of Laboratory practice. For this purpose a room will be fitted up in which the pupils may work quite independently of each other, under the direction of the Professor. A table, drawer, cupboard, and shelves, will be provided for each exclusively, and also ready access to the larger and more expensive pieces of apparatus belonging to the Institution.

Pupils entering on such Studies will necessarily pay an additional fee, proportioned to the length of course of practice.

It is also deemed necessary to provide for such students, as may require it, Instruction in the Modern Languages, at moderate fees, in classes supplementary to those already enumerated.